STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086
(For candidates admitted from the academic year 2023 – 2024)

B.Sc. DEGREE EXAMINATION, APRIL 2026
BRANCH III - PHYSICS
SIXTH SEMESTER

COURSE : MAJOR ELECTIVE
PAPER : LASER PHYSICS
SUBJECT CODE : 23PH/ME/LP45
TIME : 3 HOURS **MAX. MARKS: 100**

Q. No.	SECTION A Answer ALL questions (10 x 2 = 20 marks)	CO	KL
1.	Define a meta-stable state and its significance in laser action?	1	1
2.	Write the difference between spontaneous and stimulated emission.	1	1
3.	Differentiate Temporal and spatial coherence.	1	1
4.	Define the divergence angle of a laser.	1	1
5.	What are the advantages of a molecular gas laser?	1	1
6.	Differentiate between the liquid laser and the gas laser	1	1
7.	Write a note on impurity conductors.	1	1
8.	What are the advantages of a semiconductor laser?	1	1
9.	Name any three uses of lasers in medicine.	1	1
10.	What is Lidar? Where is it used?	1	1
Q. No.	**SECTION B-I** **Answer ANY FOUR questions (4 x 5 = 20 marks)**	**CO**	**KL**
11.	Explain different types of pumping techniques in different types of lasers.	2	2
12.	Discuss the line broadening mechanism of spectral lines.	2	2
13.	With the neat energy level diagram to explain the working of the CO_2 laser.	2	2
14.	Explain how the laser action is achieved in a diode laser?	2	2
15.	The output power of a given laser is 1mW and the emitted wavelength is 690 nm. Calculate the number of photons emitted per second. If the area of the laser beam is$10^{-6}m^2$, then find the intensity of the laser beam.	2	2
Q. No.	**SECTION B-II** **Answer ANY FOUR questions (4 x 5 = 20 marks)**	**CO**	**KL**
16.	Enumerate the different types of cavity configurations in lasers.	3	3
17.	Explain the characteristics of a laser.	3	3
18.	Explain the working of HCl laser.	3	3
19.	Analyze the principle of a PN junction laser with an energy level diagram.	3	3
20.	Describe with a block diagram the working principle of optical fiber communication	3	3

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Q. No.	SECTION C-I Answer ANY TWO questions (2 x 10 = 20 marks)	CO	KL
21.	Explain Planck's quantum theory of radiation.	4	4
22.	Obtain the relation for the optimum output power of three level laser system.	4	4
23.	Explain with the help of an appropriate energy level diagram how stimulated emission results from electron impact pumping in a He-Ne gas laser.	4	4
24.	Discuss the application of lasers for the treatment of eye surgery.	4	4
Q. No.	**SECTION C-II** **Answer ANY TWO questions (2 x 10 = 20 marks)**	**CO**	**KL**
25.	Derive Einstein's relation for stimulated emission and hence explain the existence of stimulated emission.	5	5
26.	Describe the construction, energy level diagram, and working of the Nd-YAG laser.	5	5
27.	What is a dye laser? Describe the construction and working of the laser with necessary diagrams.	5	5
28.	Explain with a neat sketch the construction and reconstruction of a hologram using a laser beam.	5	5

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